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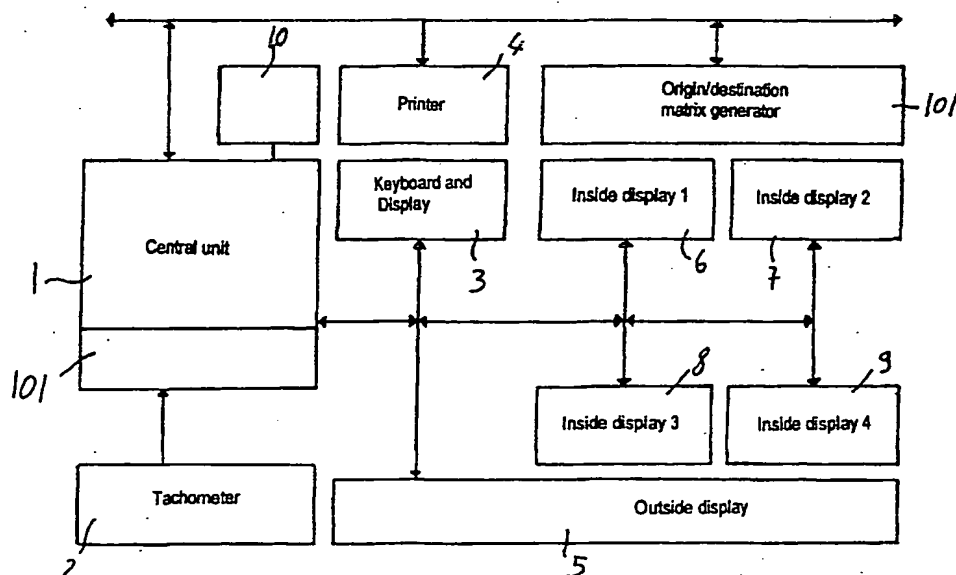
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(54) Title: A DEVICE FOR CALCULATING FARES IN VEHICLES, PARTICULARLY TAXIS, COLLECTIVE TAXIS, BUSES, OR THE LIKE



## (57) Abstract

A device for calculating fares in vehicles, particularly in taxis, collective taxis, buses, or the like, comprising: a clock; a tachometer; means for displaying the trip cost and/or the relevant parameters for calculating said cost; one or more memories for reading and writing calculation parameters which can be either preset or determined in real time, and one or more memories containing the control and calculation programs; a central calculation and control unit, whereto the above listed means are connected and which coordinates and control them to execute calculation and display procedures. According to the invention, the device also comprises: means for differentiated and customized calculation of the trip cost for each of several passengers who travel in the same vehicle at least for a part of the same route.

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A device for calculating fares in vehicles, particularly taxis, collective taxis, buses, or the like

10       The invention relates to a device for calculating fares in vehicles, particularly taxis, collective taxis, buses, or the like, comprising:

      a clock;

      a tachometer;

15       means for displaying the trip cost and/or the relevant parameters for calculating said cost;

      one or more memories for reading and writing the calculation parameters which can be either preset or determined in real time and one or more memories

20       containing the control and calculation programs;

      one central calculation and control unit, whereto the above means are connected and which coordinates and controls them to execute the calculation and display procedures.

25       The invention has the object to improve a device of the type described hereinbefore so that, thanks to relatively inexpensive arrangements, it is more appropriate for multi-user transport, while providing easier operations for determining the cost of single  
30       trips.

Currently, there exist two opposing needs. On the one hand, the need to implement the so-called collective taxi services. These services are supposed to be used by a limited number of users, substantially  
5 corresponding at the most to the load of people allowed by the homologation of vehicles, which travel in the same direction, but share one part only of the total route up to the final predetermined destination.

In this type of services, the determination of the trip cost is very complex. Graded fare tables have been  
10 created which, however, cannot account for multiple variants and usually excessively penalize certain uses of the vehicle, such as particularly short routes, while being advantageous for long routes. Further,  
15 these tables cannot easily account for the number of users traveling for the same part of the route, since this would involve a much more complex calculation by the driver, than the one required to determine the fare according to the route length.

Therefore, a further object of the invention is to provide a device as described hereinbefore, which completely, or at least significantly releases the driver from the difficulty to determine the trip price, and which can generate a fairer cost as related to  
25 travel conditions, by constantly monitoring them during the trip.

The invention achieves the above purposes by providing a device as described hereinbefore, in which there are further provided means for differentiated and  
30 customized calculation of the trip cost for each of

several passengers who travel in the same vehicle at least for one part of the same path.

According to their specific implementation, said means may consist of hardware or of software only, or  
5 of a combination thereof.

Hence, for example, by using a calculation and control unit consisting of a processor circuit or the like, multi-user functions may be implemented by simply making one appropriate change to the control program,  
10 and possibly by adding a peripheral unit, which is not provided for traditional single-user operations, not being required therefor.

A device in accordance with the invention is very flexible as to the development of automated operations,  
15 so that the direct intervention of the customer or of the driver is increasingly reduced.

Particularly, the device according to the invention may comprise means for assigning and/or entering a reference or identification code for each  
20 passenger. These means may be simply manual or vocal means, whereby the ID code is stored in the device and communicated to the customer. For instance, when the customer gets into the vehicle, he/she may take a progressive number, tearing it off a tape in an  
25 appropriate distributor and tells it to the driver, who enters the new code into the taximeter.

A vocal interface, electronic customer identifying means, such as a card, a recognition signal transmitter, possibly a cellular phone, a magnetic or  
30 processor card, a GPS device or the like can be

provided in combination with or alternatively to the manual means, and alternatively to or in combination with each other, the device being provided with the corresponding readers and/or receivers of user ID signals. Hence, the user is automatically recognized and the taximeter is automatically advised so that it can open a new user entry. When the user gets out of the vehicle, he/she can indicate his/her code, displayed during the trip, to the driver or the taximeter, which will display the trip cost and delete the memory area when the user has got out.

The user may be also vocally advised of his/her code, alternatively or in combination with the code display.

When automatic means for detecting the presence of the customer are provided, the trip cost may be also automatically charged, e.g. to a magnetic or microprocessor card, such as a credit card, an ATM card, or the like, or through a transceiver such as a GPS terminal or a cellular phone with bill charging.

The display may have several functions. It can display the progressive cost for a user at a time, either on request or sequentially at a predetermined rate. Moreover, instead of displaying cost and trip parameters of one user, it can also show such parameters for a user group, even partial, there being provided a control for recalling on the screen the parameters of the other user groups, or the latter being sequentially displayed at a predetermined rate.

With reference to the device operation, the latter

comprises a memory or a memory area which is subdivided into areas, being each reserved for an ID code of a passenger, and wherein the relevant parameters for calculating the trip cost, at least until the passenger gets out of the vehicle, measured in real time and/or entered by the passenger, are stored by units which automatically detect when he/she gets in and/or out and/or by operating personnel.

The trip cost may be also printed by a printer controlled by processing and controlling means.

According to an advantageous improvement, the trip parameters also include a reference parameter indicating the maximum trip cost.

This parameter may be dynamic, depending on the trip length from origin to destination.

Advantageously, the device comprises display means outside the vehicle, which indicate the direction or the destination of the vehicle. Such indications may be preset manually by the driver or through a vocal interface, or otherwise.

According to a preferred operation protocol, the device has a table of base cost correction coefficients, which account for the number of users traveling along the same route and for the trip duration. The fare correction coefficients may change dynamically according to the different travel conditions for partial lengths of the trip. Particularly, a new correction coefficient may be applied to the next trip length when a user in the same vehicle gets out of it or into it.

The above description clearly shows the advantages of this invention, consisting in that, by simple and relatively inexpensive means, the trip cost may be accurately calculated.

5       Therefore, the device provides a fair calculation of the costs for collective taxi services, thus considerably reducing travel expenses. All this by monitoring constantly and in real time the actual travel conditions for the user, the travel time and the  
10 trip length. Each customer only pays for the service he/she has used, while the device for obtaining such effect does not have to be particularly complex, expensive and difficult to use.

      The outside indication of the taxi direction  
15 allows the user to choose according to the substantial correspondence of the vehicle direction to the destination of the user. The destination may dynamically change during the trip.

      The invention also relates to further improvements  
20 which form the subject of the dependent claims.

      The characteristics of the invention and the advantages derived therefrom will be more apparent from the following description of a non-limiting exemplary embodiment, illustrated in the accompanying drawing, in  
25 which:

      Fig. 1 shows a block diagram of a preferred embodiment of the multi-user taximeter according to the invention.

      With reference to fig. 1, a taximeter for a multi-  
30 user taxi as described hereinbefore comprises a central



unit 1, e.g. of the processor type with memories 101 for the control program, for storing parameters relating to the user code, the trip time, the trip length, the trip start and end time, as well as the  
5 number of users and the travel time shared with a certain number of users.

Instead of a microprocessor structure, other more simplified hardware types may be provided, wherein the control program and the memory areas with allocations  
10 and addresses for the different above listed parameters are predetermined.

The central unit 1 obviously has a clock, not shown in detail, or anyway a clock input, an input for a tachometer 2 and one or more inputs for a keyboard 3  
15 and any other data entry means 10.

These other data entry means may consist of magnetic card readers, processor card readers, transceiver units, such as a transceiver for cellular phones or for the GPS system or other types of sensors,  
20 which can be provided all together, in combinations or subcombinations with each other or alternatively to each other.

The central unit 1 also has several outputs, whereto a printer 4, an outside display 5, for  
25 indicating the trip final destination, one or more inside displays 6, 7, 8, 9, for separately displaying relevant parameters of cost, time, distance in kilometers and the relevant ID code of each user whereto said parameters are related.

30 Similarly to the above indications about the means

for entering and assigning the user code, the central unit 1 may advantageously have, in combination or subcombination therewith or alternatively thereto, outputs for means for writing on magnetic cards, processor cards, or for means for transmitting data on cellular phone networks and GPS or the like.

Displays may also consist of a number of small displays each reserved for a user, in case of a small maximum number of users that can travel along the same trip or may consist of a single display, which is subdivided by the control program into several areas. A single display whose size allows to display data for at least one user and which is controlled in such a way as to sequentially display data for the other users may be also provided, possibly allowing the first user who leaves the vehicle to have the display priority. Such sequential display method may obviously be used when there is a greater number of users, even when there are provided the other above listed types of displays.

Alternatively to or in combination with the tachometer, the central unit may have a connection interface or be a part of a computerized navigation device, in which the vehicle position is detected by the satellite network and is referred to and compared with a map stored in the device. This may also provide advantages for users who can always rely on precise references for the way to reach the different destinations.

The device according to the invention has a very easy operation.

When a first user gets into the vehicle, he/she informs the driver about his/her destination. Then, the driver enters the destination into the central unit, which displays it outside the vehicle, through outside displays. The user is also assigned an identification code which is duly stored. The trip starts and so does the calculation of the cost based on time and distance in kilometers. The potential next customers, which could share at least a part of the trip can find if the vehicle direction corresponds to their destination, thanks to the outside displays. When another user gets into the vehicle, he/she informs the driver about his/her destination, and the driver updates the indication of the trip destination if needed, i.e. if the latter is more distant than the previous one. The second customer also is assigned an identification code and, like for the first one, the trip cost starts to be calculated. A correction coefficient is now added to the former parameters, which reduces the trip cost according to the number of users who share the trip or a part thereof. This reduction coefficient increases with the number of passengers being in the vehicle at the same time, i.e. the trip cost decreases as the number of users sharing the vehicle increases, and automatically increases when one or more users get out of the vehicle. In fact, when a user gets out, he/she tells the driver what his/her code is, and the driver collects the corresponding cost, resets the customer code and possibly issues a receipt, a ticket or an invoice, by using the printer.

This operation can vary depending on the means for entering the user code and for executing the payment transaction as well as for deleting the user code. If credit cards or prepaid stored value cards of any type  
5 are used, then the customer code can be entered into and deleted from the card when the card is read, that is when the user gets into the vehicle, and when it is written, that is when the user gets out of the vehicle. Communication with bank circuits for credit cards takes  
10 place through radio transmission means, cellular phones or GPS network. In this case, the receiving-transmitting means of the cellular or GPS type associated to the central unit communicate through the cellular or GPS network by the cellular phone or the  
15 GPS terminal of the user. In this manner, these means can detect the user presence and automatically start the procedures for assigning and deleting the user code. The procedures for charging the trip cost and for performing the transaction can be also executed through  
20 the cellular or GPS network and the bill, or the stored value or reloadable card, associated to the cellular phones or to the GPS terminals can be charged therewith.

According to a further improvement, the central  
25 unit 1 may be also possibly provided with an interface for communication with an automatic motorway toll charging system. In this case, the toll cost can be automatically loaded as a parameter for calculating the trip cost and subdivided among the users in the vehicle  
30 at that moment.

Obviously, the motorway toll cost may be also manually loaded by the driver through the keyboard.

Instead of the keyboard, a data entry system operating with vocal controls or controls of any other  
5 type may be also provided.

According to an improvement, one or more trip cost discount or surcharge coefficients may be also preset, such as discount coefficients for very high trip costs, above predetermined amounts, or different discounts  
10 and/or surcharges for different time periods or days such as working days, holidays, or particular days.

CLAIMS

1. A device for calculating fares in vehicles, particularly taxis, collective taxis, buses, or the like, comprising:

5       a clock;

      a tachometer;

      means for displaying the trip cost and/or the relevant parameters for calculating said cost;

      one or more memories for reading and writing the  
10     calculation parameters which can be either preset or determined in real time and one or more memories containing the control and calculation programs;

      one central calculation and control unit, whereto the above means are connected and which coordinates and  
15     controls them to execute the calculation and display procedures, characterized in that it further comprises:

      means for differentiated and customized calculation of the trip cost for each of several passengers who travel in the same vehicle at least for  
20     one part of the same path.

2. A device as claimed in claim 1, characterized in that it comprises means for assigning and/or entering a reference or identification code for each passenger.

25     3. A device as claimed in claim 1 or 2, characterized in that it comprises a memory which is subdivided into areas, being each reserved for an ID code of a passenger, and wherein the relevant parameters for calculating the trip cost, at least  
30     until the passenger gets out of the vehicle, measured

in real time and/or entered by the passenger, are stored by units which automatically detect when he/she gets in and/or out and/or by operating personnel.

4. A device as claimed in one or more of the preceding claims, characterized in that it has means for displaying at least the passenger ID code and at least the relevant trip cost for each passenger in the vehicle.

5. A device as claimed in claim 4, characterized in that said display means may be of the type that displays simultaneously the relevant parameters for at least a limited or partial number of travelers in each of several separate areas and/or of the type that is provided with means for scrolling or browsing the screens one by one or a limited or partial set of screens of one or more passengers at a time.

6. A device as claimed in one or more of the preceding claims, characterized in that the means for assigning and entering the customer code may consist of means for manually entering or signaling when the passenger gets into the vehicle, or of electronic customer identifying means, such as a card, a recognition signal transmitter, possibly a cellular phone, a magnetic or processor card, a GPS device or the like and the corresponding readers and/or receivers of user ID signals.

7. A device as claimed in one or more of the preceding claims, characterized in that there may be provided means for identifying the customer when he/she gets out of the vehicle and for indicating the trip

cost, which can be operated manually by the customer or others upon vocal indication of the customer ID code, or by a magnetic card, a radio signal transmitter, a microprocessor card, a cellular phone or a GPS terminal  
5 or other recognition means.

8. A device as claimed in one or more of the preceding claims, characterized in that it has a memory area with a table or a program for calculating trip cost increasing or decreasing parameters according to  
10 the number of users traveling along the same route, to the length of the shared route, and to the sharing time.

9. A device as claimed in one or more of the preceding claims, characterized in that it has at least  
15 one display outside the vehicle for displaying the travel destination, in combination with means for entering the destination.

10. A device as claimed in one or more of the preceding claims, characterized in that it has an  
20 interface for communication with an automatic motorway toll charging system.

11. A device as claimed in one or more of the preceding claims, characterized in that it has an interface for communication with a position detecting  
25 system and with a route guide map.

12. A device as claimed in one or more of the preceding claims, characterized in that it has a central control and processing unit whereto at least one memory, at least one clock, at least one  
30 tachometer, data entry means, means for deleting and



editing data, display means inside the vehicle and display means outside the vehicle, as well as printing means are connected.

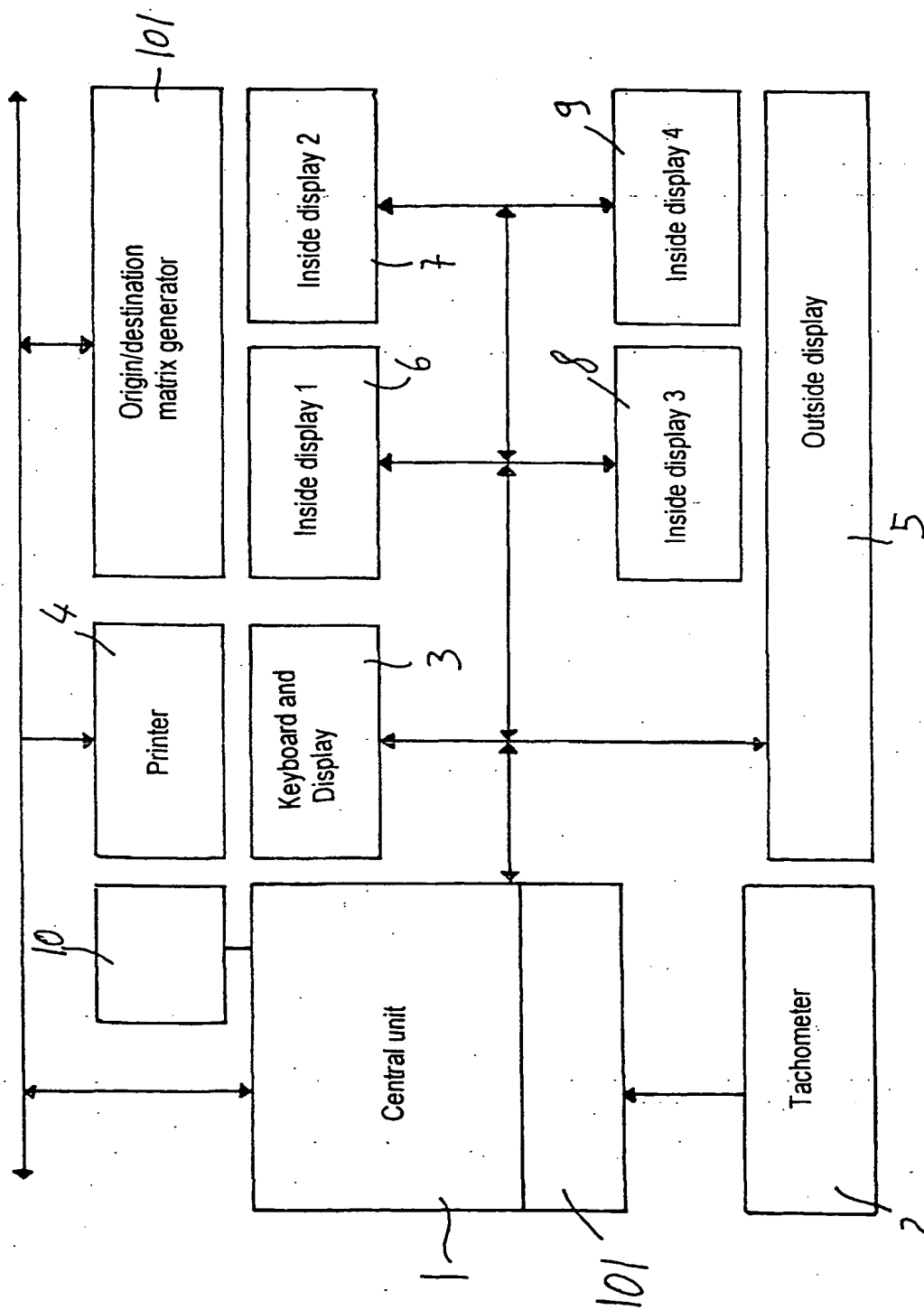
13. A device as claimed in one or more of the preceding claims, characterized in that the central unit has an interface for connection with means for reading/writing on magnetic or microprocessor cards.

14. A device as claimed in one or more of the preceding claims, characterized in that the central unit has means for interface with a transmitting/receiving unit of the cellular or GPS network.

15. A device as claimed in one or more of the preceding claims, characterized in that the central unit has means for interface with the electronic bank transaction network.

16. A device as claimed in one or more of the preceding claims, characterized in that it comprises a program and memories for presetting one or more trip cost discount or surcharge coefficients, such as discount coefficients for very high trip costs, above predetermined amounts, or different discounts and/or surcharges for different time periods or days such as working days, holidays, or particular days and for calculating said discounts and said surcharges.

17. A device for calculating fares in vehicles, particularly taxis, collective taxis, buses, or the like, wholly or partly as described, illustrated and for the purposes stated herein.



# INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP 99/02135

**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC 6 G07B13/00

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 G07B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

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☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

30 July 1999

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# INTERNATIONAL SEARCH REPORT

Inter. Application No

PCT/EP 99/02135

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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International Application No

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